

PRODUCTS THAT TELL STORIES: THE USE OF SEMANTICS IN THE DEVELOPMENT AND UNDERSTANDING OF FUTURE PRODUCTS

Dr Martyn EVANS¹ and Pete THOMAS²

¹ Lancaster University

² University of Dundee

ABSTRACT

This paper explores the relationship between semantics and product design, and its role in the communication of new product types to users. It focuses on supporting product design students in the development of understanding of the theoretical base of semantics, and in turn how this can underpin the development of narratives that assist users in addressing the challenge of how to conceptualise and interact with new products types.

Keywords: Product design, semantics, product narratives, product understanding, usability, future products

1 INTRODUCTION

This paper outlines an educational approach that enables student designers to (i) understand the concept of semantics and its relevance to product design, and (ii) utilise a collection of techniques to better understand and communicate the purpose and behaviour of new product types to users. The authors outline how they support product design students in the development of an awareness of the theoretical concepts associated with semantics, and enable students to apply this learning in their own design practice. This approach provides a link between the theoretical base of semantics and opportunities for storytelling in design through the use of product narratives as a mechanism to aid product understanding (particularly of future products).

2 RESEARCH CONTEXT

Over three decades ago Ingram [1] declared that ‘the old dictum of form follows function is increasingly inappropriate as products become less mechanical and more electronic’. This statement is still highly relevant to the rapidly changing, technologically driven consumer product environment we now live in.

As a way of assisting designers in the challenge of creating meaningful products that consumers understand and desire, there has been much discourse considering the nature and role of semantics in design [2,3,4]; and of particular relevance to product design is the concept of product semantics. Krippendorff and Butter [4] detailed product semantics as ‘a study of the symbolic qualities of man-made forms in the cognitive and social contexts of their use and the application of the knowledge gained to objects of industrial design’ attributing its development as ‘a reaction to the missing *sense* modern industrial products make’ to users [5]. Norman captures the contemporary challenge of making sense of (digital) products, claiming, “Mechanical devices tend to be self explaining. Their moving parts are visible and can be watched or manipulated. They make natural sounds that help us understand what is happening. ... Today, however, many of these powerful indicators are hidden from sight and sound, taken over by silent, invisible electronics.” [11]

Product semantics recognises that people do not respond to the physical qualities of objects but act on what they mean to them, and as such presents a challenge to design [6,7]. Over the last decade there has been an increasing debate regarding the manner in which designers can engage with the theoretical concepts of semantics to effectively develop and evaluate products that consumers can understand. This is exemplified by the annual DeSForM conference (Design and Semantics of Form and Movement), which commenced in 2005, and aims to ‘bring together researchers in the field of design

and semantics of forms and movement to assess the outcomes of this research and begin to identify issues and territories for future investigation and exploration' [8]. Despite the developing interest in this area, Moultrie [9] claims that product semantics is 'a relatively new body of knowledge, and there remains much to be done in understanding and classifying the various elements of consumer response. Work in consumer response remains largely unconnected to research in the design domain'. It is clear that there is a need in design to understand how best to develop approaches that assist in the understanding of consumer responses to new products.

Despite the increasing discourse regarding design and semantics there has been relatively limited consideration given to the development of such concepts in the design curriculum [10]. Product design students face a plethora of challenges that educators could not have imagined 30 years ago. In a global consumer environment increasingly driven by new technological advances, it's critical that product designers are able to create meaning and enable intuitive understanding of the products they design. Formal training within the design curriculum varies greatly within this arena and often design students lack an understanding of the benefits of a semantic approach to support usability in product design.

An area of particular relevance of this approach is where new product paradigms are emerging, particularly in the development of digital products. Drawing upon Norman's concept of 'attractive things work better' [11] the authors assert that the use of semantics in product design can improve the understanding of, usability, and user-testing of future products. As Thomas [12] states, 'the capability and meaning of any form can be defined by the limits of people's ability to imagine what it can be physically or represent spiritually or intangibly' thus an understanding of semantics enables the designer to emphasise or challenge a user's existing perception of a product's likely purpose and behaviours. In doing so they create product narratives that assist users in addressing the challenge of how to conceptualise and interact with new products types. This aims to address the myopic perspective of users whose imagination may be limited by their experience and understanding of what is possible and desirable.

2.1 Research approach

In 2007 one of the authors reported an approach for deconstructing product semantics into a language that is appropriate for product design students [10], providing evidence that this enabled students to articulate design problems in a new way; to engage in research about the meanings their designs might have for others; and to enhance their ability to defend their proposals in the face of competing discourses. This work was based upon a 15 credit module delivered on the MSc Industrial Design programme at the University of Salford, UK. This 12 week module required students to engage with a range of theoretical concepts related to product semantics and meaning, and resulted in a (digital) log which demonstrated an understanding of product semantics and their value to design. The success of this module led the authors to consider if, and how, a selection of such concepts could be communicated to undergraduate product design students in a much more compressed and time-limited manner within existing Product Design modules at the University of Dundee.

The BSc (Hons) Product Design programme at the University of Dundee enables students to use digital technologies to respond to user driven insights. For this research, the authors aimed to utilise a collection of product semantic techniques in order that product design students could better understand and communicate the purpose and behaviour of new product types to users. Due to the compact nature of the undergraduate curriculum, there was a need to provide an overview of product semantics in such a way that there was a direct and rapid application of the learning. The authors developed a one day workshop format that provided an overview of key concepts of product semantics combined with a mechanism for students to apply these concepts to their design practice. Key concepts covered during the workshop included functionality, perceived affordances, character traits, identifiers, intrinsic motivators, expressives, motivators, metaphors, pointers, and instructions. The structured workshop format was developed and restructured over a number of iterations over 3 years of delivery across all four years of the product design programme at Dundee.

The authors note a gradual yet key movement away from the use of formal semantic terminology to underpin the learning to a more design-led approach that draws upon concepts of narrative and storytelling. Such use of narrative provides an opportunity to engage students with a theoretically dense area in a language and format that is designer-friendly.

Furthermore there has been a movement away from analysis of student projects, towards the analysis of existing products. This is a response to difficulties that students have demonstrated in being able to analyse their own work that can be attributed to 2 key factors:

1. Prior to the workshop the students' projects may not contain enough rigorous design thought to offer enough opportunity for analysis.
2. Using the workshop as a design tool requires the entire cohort to be at a similar stage of design development which is frequently not the case.

The one-day workshop was delivered in three interconnected parts:

- *Part 1:* 30 minutes seminars with groups of up to 7 students. Students were asked to present a 90 second deconstruction of a product in which they would explain what they thought the designer's intent was. This was followed by discussion of each of the key points raised. As each student in turn presented the points the students were encouraged to identify schema and links.
- *Part 2:* A 45 minute lecture which overviewed product semantics including its theoretical base, its application in design, and a number of key concepts of particular relevance to product design. A case study analysis of an existing product was utilised to provide the link between the theory of semantics (of which students were somewhat wary of) and their application in design practice.

Product Design / IP40001 / Storytelling in Design			
Name			
<p>01 / Functionality What is the primary function of your product? What other functions does it have? What else can it do? What category of object is it?</p> <p>Identify Product Functions and category.</p>	<p>03 / Character Traits A combination of traits define the character of a product. They are usually expressed by adjectives. Semantic dimensions can help us to describe the character of artifacts.</p> <p>Locate your product with the Semantic dimensions. Please use the space provided to define your own Semantic Dimensions.</p> <p>Material Furniture .</p>	<p>06 / Perceived Affordances Perceived Affordances are the [designed] properties of an object that suggest how it could be used.</p> <p>Identify any Perceived Affordances.</p>	<p>08 / Distinguishers These are product features which have been designed to be distinct in order to clarify, or dictate, how to use a product.</p> <p>List examples of Distinguishers.</p>
<p>02 / Identifiers These suggest to users what something is and the category it belongs to. Identifiers often refer to Archetypes, but can help us to distinguish between sub-archetype categories.</p> <p>List examples of identifiers, considering:</p> <p>Form</p> <p>Colour</p> <p>Material</p> <p>Environment (if any)</p> <p>Style</p>	<p>04 / Expressives These are material qualities expressed by an object in order to clarify, or dictate, how to use a product.</p> <p>List examples of Expressives.</p>	<p>07 / Metaphor A metaphor is when one aspect of a product borrows a meaning that you would normally attribute to something else.</p> <p>List examples of Metaphors.</p>	<p>09 / Pointers These are features that direct attention to something other than themselves as a sign and symbol.</p> <p>List examples of Pointers.</p>
	<p>05 / Intrinsic Motivators These are features that are pleasurable to use and provide enjoyment, they are often playful. They invite users to attend to, observe, touch, listen to, play with them.</p> <p>List examples of Intrinsic Motivators.</p>		<p>10 / Instructions These are generally visual or diagrammatic features that describe, how to use a product.</p> <p>List examples of Instructions.</p>

Figure 1. Semantic Analysis Worksheet

- *Part 3:* A 90 minute structured workshop activity involving the use of pre-prepared worksheets (see Fig.1). Students were asked to bring a consumer appliance from their homes and work in pairs to subject it to systematic analysis highlighting the semantic features they identified and only completing elements that they felt were relevant. They were then asked to identify and share their learning from the exercise with the whole class.

Following the workshop students were encouraged to explore how such approaches could be applied to their own design work independently.

3 RESEARCH IMPLICATIONS

The research contained within this paper is the result of over seven years of academic engagement with semantics in the context of product design. There has been much revision and refinement of the teaching approaches undertaken and as such, the authors present a summary of the key aspects of their work. It is not possible to address all of the issues encountered and work-arounds developed to help students understand, and importantly apply, concepts of semantics to their design practice.

Prior to and following the delivery of the workshops in 2011, students were invited to provide feedback on its usefulness. Students were presented with a survey that consisted of a series of questions to which they could respond on a seven-point Likert scale, to indicate:

- How well they understood the role of semantics in product design before the workshop
- How well they understood the role of semantics in product design after the workshop
- How useful they felt the workshop had been in helping them to improve their user's understanding and experience of their products

The survey also contained three open questions:

1. How do you intend to apply this learning in your practice?
2. What aspects of the workshop did you find useful?
3. How could the workshop be made better?

The research findings are discussed under two main areas: i) implications for educators, and ii) student feedback and application.

3.1 Implications for educators

The authors assert that the use of semantics in product design can improve the understanding of, usability, and user-testing of future products. Following the most recent workshop all of the students felt the workshop had been useful in helping them to improve their user's understanding and experience of their products. Although this is easy to state, the development of an understanding of such concepts to the point that they can be applied in students' design practice is very challenging. The following reasons are identified:

- It was clear from seminar activity that the students exhibited the intellectual capacity to 'deconstruct' products, but also that they lacked a coherent cognitive framework with which to do so. The theoretical base of semantics is alien to the majority of product design students and they struggle to i) understand the concepts, and ii) apply the concepts to their design practice. The authors have developed a structured approach that 'scaffolds' the students through this process.
- The use of a broad range of both visual and physical examples that draw upon contemporary design practice is essential if students are to see the link between the 'theory' and their design activity. Students struggle with the ambiguity that exists in subjective semantic analysis, as such examples need to be distinct and clear with key regard for students learning.
- Students struggle with the language rather than the theory of semantics. The language used within the workshop is critical to the ability (and desire) of students to engage with the theoretical concepts. The authors have moved away from the more formal use of semantic language to the notion of storytelling in design. This narrative approach helps to connect students with the underlying concepts without the need to be aware of the explicit notion of semantics. The use of storytelling in design – or product narratives – helps to demonstrate to students the value and benefit of this approach advocated within this paper. Increasingly storytelling is being used in design to explore, communicate and understand complex user scenarios and as such, is a useful link in the development of future products. Most importantly, establishing a shared, common and consistent language enables discussion and fosters understanding between students.
- The translation of an understanding of semantics into students' own design practice is challenging and not always completely successful. The development of the structured worksheets goes some way to assisting the application of theory into practice but this is still problematic. Generally students are capable of applying theoretical concepts to existing products but less so to their own design practice.

3.2 Student feedback and application

Students were forthcoming with both informal and formal feedback, which has been used to shape the approaches advocated within this paper. The workshop was delivered twice to undergraduate students in 2011, first to Level 3 students and secondly to Level 4 (final year) students. The structure in each case was slightly different. The workshop outlined above was delivered to level 4 students as a development of that previously delivered to level 3 students. There were 2 principal differences between the workshops:

- The Level 3 workshop was focussed around students analysing their own projects, reflecting on this and redesigning their products to incorporate their learning whereas the Level 4 workshop was focussed on analysing consumer products selected by the students.

- The Level 4 workshop introduced seminars prior to the lecture, which enabled students to start considering how to think about product meanings without having a formal framework or language to do so.

Before the Level 3 workshop 12% of the students (2 out of 18) indicated a positive understanding of the role of semantics in product design. After the workshop this figure rose to 100%. 78% of students (14 out of 18) felt the workshop had been useful in helping them to improve their user's understanding and experience of their products.

Before the Level 4 workshop 21% of the students (5 out of 24) indicated a positive understanding of the role of semantics in product design. After the workshop this figure rose to 100%. Likewise 100% of students felt the workshop had been useful in helping them to improve their user's understanding and experience of their products.

There were consistent issues highlighted by students across both levels, the key recommendations are highlighted below:

- Students want the opportunity to apply this to their projects in a structured way and at an appropriate time in their learning.
- Students would like to see more examples and illustrations of the different concepts to increase clarity and understanding.

Level 4 students also highlighted that they would have liked to receive the workshop earlier in their studies.

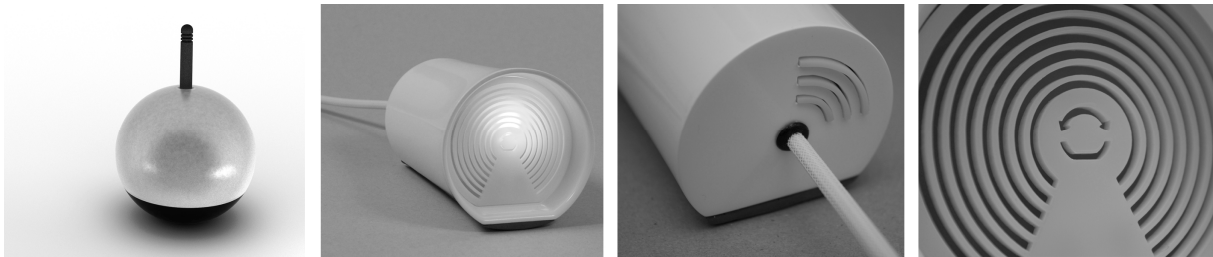


Figure 2. *Light Sync before and after the workshop.*

A typical example of how students were engaged with the worksheet is illustrated in Fig 2. The student had developed a product, Light Sync, that could enable 'glanceable off-screen communication' between distributed teams. His first concept utilized a very simple geometric form offering no indication of what the object was or how it should be used. After the workshop the student revisited the concept introducing a simple metaphor of a paper-cup telephone to suggest the product's capacity to connect users. The braided cabling was specifically chosen for its 'string-like' appearance to continue this analogy. The rounded base of the device was intended as an affordance to indicate that the product should be rolled from side to side to change colour and this was reinforced by an icon or pointer within the centre of the diffuser grill covering the light. The directional icon also forms part of a playful face, again alluding to the capacity for communication. The diffuser itself contains a metaphor of radio waves emanating from an aerial, a device which is echoed on the detailing of the 'transmit' button to the rear of the device. The button is set proud of the housing to suggest it should be touched and distinguished in both colour and material to clearly, much like the base, which clearly orientates the product.

4 CONCLUSIONS

The authors assert that the approach outlined in this paper successfully enables product design students to (i) understand the concept of semantics and its relevance to product design, and (ii) utilize a collection of techniques to better understand and communicate the purpose and behavior of new product types to users. The authors acknowledge that there are a number of key areas that can be improved further, and thus highlight a number of key considerations for further work:

1. Although the framework established by Evans and Sommerville [10] can be reinterpreted and employed effectively within a compressed timeframe, students would prefer to engage with the framework, in a systematic way, over an extended period of time. The authors will develop a second workshop to enable application of students' knowledge to their own projects.

2. Students need more ‘typical’ examples to illustrate the concepts outlined in the worksheet. The authors recognize that there is an opportunity to better support students in identifying, recording and sharing such examples, as illustrated in Evans and Somerville’s [10] original work.
3. The authors recognize that the academic language that underpins semantics is the principal barrier to its appreciation and comprehension and that a shift to a narrative – storytelling – approach is both more engaging and easier for students to understand. The revised workshops will adopt a more creative, narrative based approach to semantics.
4. Finally, the students were unanimous in their belief that the workshops had been useful in helping them to improve their user’s understanding and experience of their chosen product, the authors do not yet have empirical evidence from users themselves to support the approach advocated within this paper. There is an opportunity for students to design experiments to test this hypothesis and in doing so to improve their understanding of the subject.

Due to the limited format of this paper, the authors have not provided in-depth evidence of student perceptions of the approach advocated in the paper. To this end, it is fitting to conclude with student feedback regarding the research outlined previously: “*I always considered product semantics to be somewhat like the analysis of poetry I had to do in my high-school English class. This generally involved overenthusiastic interpretations and finding metaphors and hidden meanings that I had a hard time believing the author himself had intended. The storytelling workshop definitely helped shake this view, and now with a greater understanding of product semantics I find myself considering the finer details of my designs much more, and I now realize the considerable effect some decisions can have on the overall perception of a product.*”

REFERENCES

- [1] Ingram J. Designing the User Experience. In: *Design: Science: Method. Proceedings of 1980 Design Research Society Conference*, Portsmouth, December 1980, (Eds) Jacques R. and Powell J. pp.171-175 (Westbury House).
- [2] Bürdek B.E. *Design, Geschiedenis, theorie en praktijk van de productontwikkeling*. 1991 (Ten Hagen Stam).
- [3] Vihma S. *Products as Representations: A Semiotic and Aesthetic Study of Design Products*. 1995 (Art Books International).
- [4] Krippendorff K. and Butter R. Product Semantics: Exploring the Symbolic Qualities of Form. *Innovation*, 1984, 3(2), 4-9.
- [5] Krippendorff K. On the Essential Contexts of Artifacts or on the Proposition that Design is Making Sense (of Things). *Design Issues*, 5(2), 9-39.
- [6] Krippendorff K. Product Semantics: A Triangulation and Four Design Theories. In *Product Semantics '89: Proceedings from the Products Semantics '89 Conference*, Helsinki, May 1989, (Ed) Vakeva S. pp.a1-a23 (UIAH).
- [7] Feijs L. & Kyffin S. A Taxonomy of Semantic Design Knowledge. In: *Design and Semantics of Form and Movement*, Newcastle, November 2005, (Eds) Feijs L., Kyffin S. and Young B. pp. 70-83 (Koninklijke Philips Electronics N.V.).
- [8] Feijs L., Kyffin S. and Young B. Design and Semantics of Form and Movement, Newcastle, November 2005 (Koninklijke Philips Electronics N.V.).
- [9] Moultrie J. Seeing Things: Consumer Response to Product Appearance. In: *Design and Semantics of Form and Movement*, Newcastle, October 2006, (Eds) Feijs L., Kyffin S. and Young B. pp. 5 (Koninklijke Philips Electronics N.V.).
- [10] Evans M. & Somerville S. Seeing is Believing: The Challenge of Product Semantics in the Curriculum. In: *International Conference on Engineering and Product Design Education*, Newcastle, Newcastle 2007.
- [11] Norman D. *The Design of Everyday Things*. 2002 (Basic Books, USA).
- [12] Thomas R. A New Dialogue. In: *Design and Semantics of Form and Movement*, Newcastle, October 2006, (Eds) Feijs L., Kyffin S. and Young B. pp. 10-19 (Koninklijke Philips Electronics N.V.).